

Of our first charge we get 409 shots in the pound of powder, of our second 256–258, and of our third 170. $2\frac{1}{2}$ drams of powder allow about 102 charges to the pound.

Of shot 96, 42 and 26 in the pound, as compared to 13 of the big gun. Of course the big gun can throw small charges, but it does not do it so well as the small one. Now we venture to say that at least 80 out of every 100 specimens killed in the forest will fall to the first and second charges, and a little amount of careful stalking and manœuvring will bring any thing else (Ducks, sea-fowl, &c.) within range of the third and big shot, special charge.

An ordinary gun-case will carry about 140 of these small cartridges, or, on an average, 700 shots, as we have shown; and we think that when the relief of carrying the smaller weight of gun and ammunition when afield collecting (especially in a hot climate) is considered, the saving in bulk, as luggage (*impedimenta*), and the saving of good ammunition (not to be got in out-of-the-way places—the best, usually, in which to collect), our collecting-brethren of the B. O. U. will thank us for the foregoing “wrinkle” about small-bore guns.

XL.—On the Interbreeding of Birds. By HENRY SEEBOHM.

THE interbreeding of birds supposed to be specifically distinct is a subject which has been much neglected by ornithologists. The existence of intermediate forms so produced has been as much as possible ignored. Where the facts were too obvious to admit of doubt, the so-called cross was contemptuously dismissed as a hybrid—a monstrosity and, as such, possessing no more scientific interest than a white blackbird or a six-legged calf. So long as each species was supposed to have had a separate origin, and to be divided by a hard and fast line from every other species, this attitude of ornithologists towards interbreeding was excusable; but now that the theory of development has been generally accepted, the subject will be found to possess the greatest interest and to throw unexpected light upon the origin of species.

The old definition of a species having lapsed, in consequence of the rejection of the theory of special creation, it is necessary to provide a new one. The first step towards an understanding of what constitutes a species is the admission of the existence of subspecies. Two forms which are apparently very distinct, as *Corvus corone* and *C. cornix* or *Carduelis major* and *C. caniceps*, are nevertheless found to be only subspecifically distinct—a complete series of examples from one extreme form to the other in each case being obtainable. These are produced by interbreeding. In the case of the Crows it has been proved over and over again that the two extreme forms not only interbreed with each other, but also with the intermediate forms; so that not only are mulattos produced, but also quadroons, octoroons, &c. Of course, in no other way could a complete series from one extreme form to the other be obtained.

In some genera of birds we find the relationship between the species still more complicated. *Lanius excubitor* inhabits Western Europe: it is an intermediate form between *L. major* of North-eastern Europe and Siberia and *L. leucopterus* of South-eastern Europe and Siberia. A complete series of examples of intermediate forms connecting *L. major* and *L. leucopterus* may be obtained; and yet both species inhabit the same district in Siberia and appear to be specifically distinct, no intermediate forms having been obtained from that country. On the other hand, both the extreme forms appear to be only subspecifically distinct from *L. excubitor*, inasmuch as in North-eastern Europe every intermediate form is found between *L. major* and *L. excubitor*, and in South-eastern Europe every intermediate form is found between *L. excubitor* and *L. leucopterus*. In this case we may assume that *L. excubitor* was the original Shrike from which *L. major* and *L. leucopterus* have varied in opposite directions. In the case of the Crows and the Goldfinches, already cited, the circumstances are probably somewhat different. The original Crow or Goldfinch may have been an intermediate form of either of the extreme forms; but there is considerable evidence to prove that, in the case of the

Crow at least, the two forms had been long enough separated for the intermediate forms to have been absorbed by interbreeding, or eliminated by sexual or natural selection, and afterwards reproduced by the interbreeding of the extreme forms wherever the geographical areas of their respective distributions again met, not only in the valley of the Yenesay, but also in the valley of the Elbe and in the highlands of Scotland.

We must, however, look upon the example of the Crows as an exceptional case. Interbreeding seldom takes place between the extreme forms, because they are too widely separated geographically. The intermediate forms occupy the intermediate localities, and were probably the original race, which has spread in different localities and has had to struggle with different difficulties, and has consequently developed in different directions, but not to such a degree as to prevent the individuals of each valley breeding with their immediate neighbours; so that a complete series from one extreme to the other is obtainable, though, as in the case of the Shrikes, the two extremes have become so widely separated that when they have subsequently remigrated into the same locality they remain distinct, having lost the power, or at least the will, to interbreed.

The case of the Shrikes may be given as a typical example of incipient species, of imperfectly segregated species, of species in the process of formation, of conspecies, of subspecies, or by whatever name ornithologists may agree in future to call the phenomenon—the great fact lying at the bottom of it all, and explaining it all, being that interbreeding takes place. We must, however, bear in mind that there is no hard and fast line between a specific difference and a difference which is only subspecific. Two forms may have become so widely separated that interbreeding between them has become physically impossible, or they may have become sufficiently separated to cause the cross to be a barren hybrid, or the produce may only be less fertile than usual, or no perceptible decrease of fertility may be observable. The practical result is that slight subspecific variations are con-

tinually lost by interbreeding; so that the similarity of individuals in a species is retained, whilst the sterility produced by a specific variation prevents the universal mongrelization of species which might otherwise take place.

Interbreeding is a check upon the indefinite multiplication of species; whilst the narrow limit in which it is possible provides against the extinction of specific differences.

A very interesting case of the interbreeding of forms hitherto supposed to be specifically distinct has just come to my knowledge.

Cinclus cashmiriensis is a well-known species of Dipper, in which the dark-brown and white on the underparts are distributed in the same manner as they are in our bird, the white throat and breast being divided abruptly from the dark-brown belly and flanks. Its range extends from Lake Baical to the Altai Mountains. In its more northern locality it meets with *C. leucogaster*, with which it apparently interbreeds; for, as is well known, every intermediate form, as well as both extreme forms, are found in the district. I have lately had an opportunity of examining a large series of Dippers, sent from the Altai Mountains by the Siberian collector of Herr Taneré of Anclam; and I find that in the southern extremity of its range *C. cashmiriensis* comes into contact with *C. sordidus*, with whom it also apparently interbreeds; for here again we have every intermediate form as well as both extreme forms. It is impossible to say whether *C. leucogaster* would interbreed with *C. sordidus* or not, because we do not know of any locality where both are found; but it is difficult to avoid coming to the conclusion that both of them interbreed with *C. cashmiriensis*. By obtaining a series of examples from both localities, a complete series of Dippers may be obtained, beginning with birds having nearly the whole of the underparts white, and ending with birds having the whole of the underparts brown, the throat and breast being only a shade paler than the belly and flanks.

In all these forms of *Cinclus* there is little or no difference in the colour of the upper parts, which makes it very difficult to suppose that the difference in colour can be a protective

one. The same remarks apply to the various subspecific forms of *Sitta europæa*.

But whatever theory we may adopt to account for the differences in the colour of nearly allied species from different localities, the fact that interbreeding takes place remains; and it is this fact which I wish to press upon the attention of ornithologists.

The case of the Crows and the Goldfinches, where the extreme forms interbreed, is exceptional. The case of the Shrikes and the Dippers, where each extreme form interbreeds with an intermediate form, may also be exceptional; but the cases where the individuals of each valley interbreed with their immediate neighbours, and where the range is great enough to make the sum of a series of small differences show a large difference in the extremes, is by no means uncommon. What I wish to emphasize is the fact that all these are cases of interbreeding, the difference in the three modifications of interbreeding which I have cited being one of degree and not of kind.

XLI.—*Notes on the Birds of the Province of Constantine, Algeria.* By CHARLES DIXON.

(Plate XIV.)

THE following notes refer to the birds either identified or collected during a short trip to Biskra and the Aurès mountains made in company with Mr. Elwes. Considering that our stay was such a brief one, and that travelling took up at least half of the month we were away from England, our success was far beyond our highest expectations. Amongst our captures were a dozen specimens of the rare little Algerian Coal Titmouse, *Parus ledoucii*; specimens of *Saxicola lugens* with the sex carefully ascertained, settling the much-vexed question as to the difference of plumage in the sexes of this bird; several examples of *Emberiza saharae*; *Phylloscopus bonelli*; a female in breeding-plumage of the rare *Sylvia deserticola*; and, last but not least, we secured two specimens of a hitherto undescribed Chat.